The High Wind Event of 13 January, 2002

I. Overview

On January 13th, a significant synoptic-scale high wind event struck the plains of western South Dakota and northeast Wyoming. Analyses indicate that this event was very similar to previous "Type A" wind events over the region , but with some subtle differences which may have accounted for the strongest winds this day.

An analysis of the peak winds on Jan 13th is shown in **Figure 1**. Winds in excess of 60 mph were observed from the Plains east of Rapid City to Buffalo, SD, and across extreme NE Wyoming. Several locations on the Plains northeast of the Black Hills had gusts greater than 70 mph (Ellsworth had peak winds of 86 mph). The strongest winds occurred during the morning of the 13th (around 15Z), with warning-criteria winds continuing throughout the day and into the early evening.

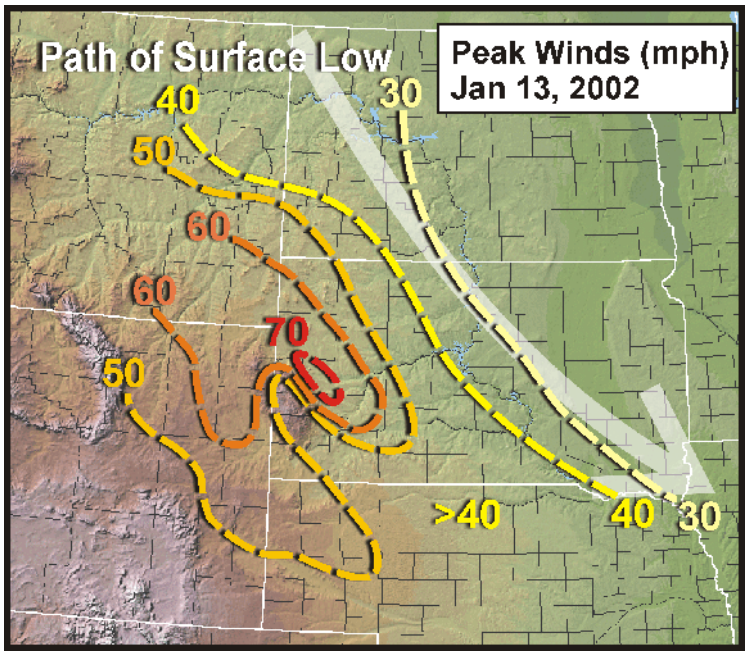

***Figure 2**. Analysis of the peak winds (mph) observed on 13 January, 2002. The path of the surface low is also shown.*

Meteorological analyses show that this event was very similar to other "Type A" high wind events observed over this area. A closed surface low moved from northwest to southeast through western North Dakota and Eastern South Dakota (path is shown in Figure 1) in conjunction with an intensifying mid-tropospheric shortwave moving through the northwest flow aloft. The 500mb height/vorticity, and surface pressure analyses (from RUC analyses) are shown in **Figure 2.**

Similar to other Type A events, this wind storm exhibited rather strong pressure rises (3 to 6 mb / 3hr) behind a surface cold front (**Figure 3**). Lower-tropospheric cold air advection was weak to moderate (**Figure 4).** The strongest winds did not occur with the initial trough passage, but rather with the passage of a secondary front (or trough) associated with a mid-tropospheric shortwave seen at 500 mb (**Figure 2**), 700mb, and 850mb (**Figure 4**), and strong surface pressure rises. The arrival

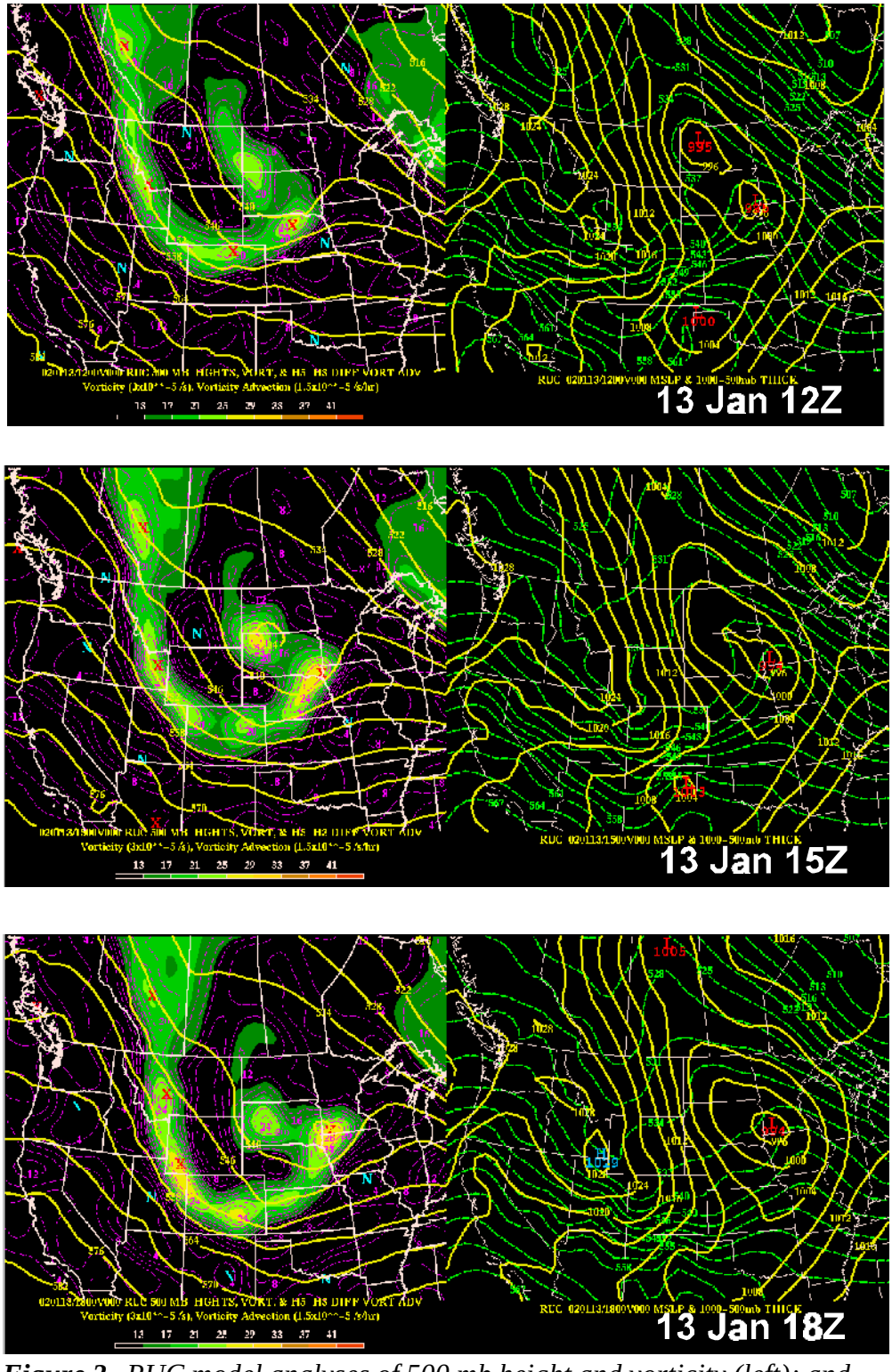

Figure 2. *RUC model analyses of 500 mb height and vorticity (left); and surface pressure and thickness (right). Analyses at 12Z (top), 15Z (middle), and 18Z (bottom).*

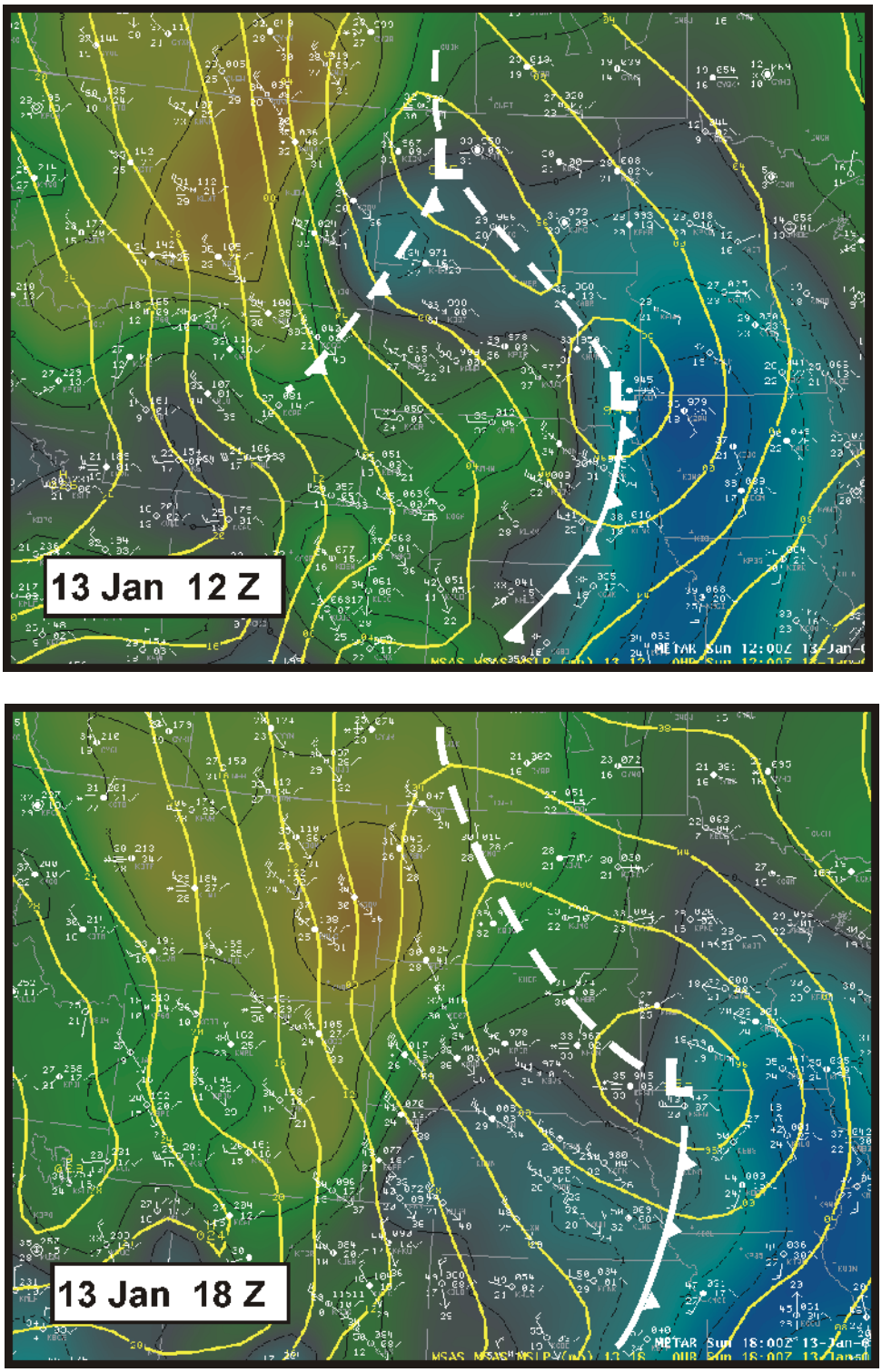

Figure 3. *Surface analyses and plots at 12Z and 18Z January 13th, 2002. MSAS (NWP) surface pressure contoured in yellow; 3 hr pressure change is shaded and contoured in black.*

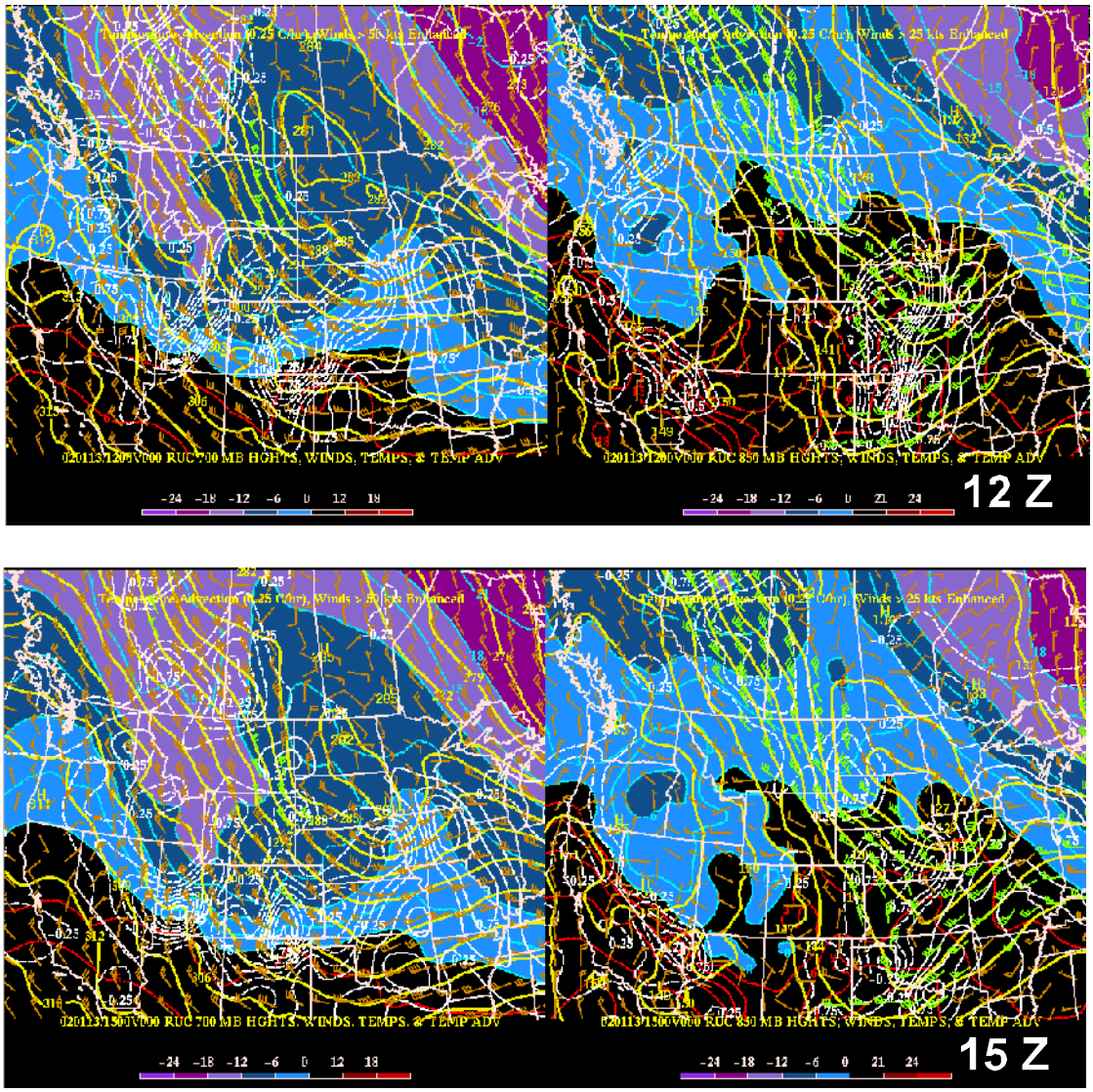

Figure 4. *700mb (left) and 850mb (right) RUC analyses of temperature (shaded) and heights at 12Z (top) and 15Z (bottom). The wave over western South Dakota in these images was associated with the strongest winds of the event.*

of this wave as seen in the 850mb analyses coincides very well with the timing of the strongest wind in this event. Similar to the initial trough passage, this secondary trough was associated with a band of snow showers, which may have aided in the downward mixing of the strongest winds observed. Snow persisted over the Black Hills much of the day within the virtually ideal 'upslope' conditions.

The ETA BUFKIT Overview data is shown in Figure 5. Like many of the high wind events investigated previously, these time-height wind speed data also illustrate the existence of 60 knot winds below 800 mb for much of the time warning criteria winds were observed. The observed sounding at 12Z 13 Jan had 50 kt winds to about 800 mb, but was prior to the development of the strongest winds. There was no 00Z 14 Jan sounding available.

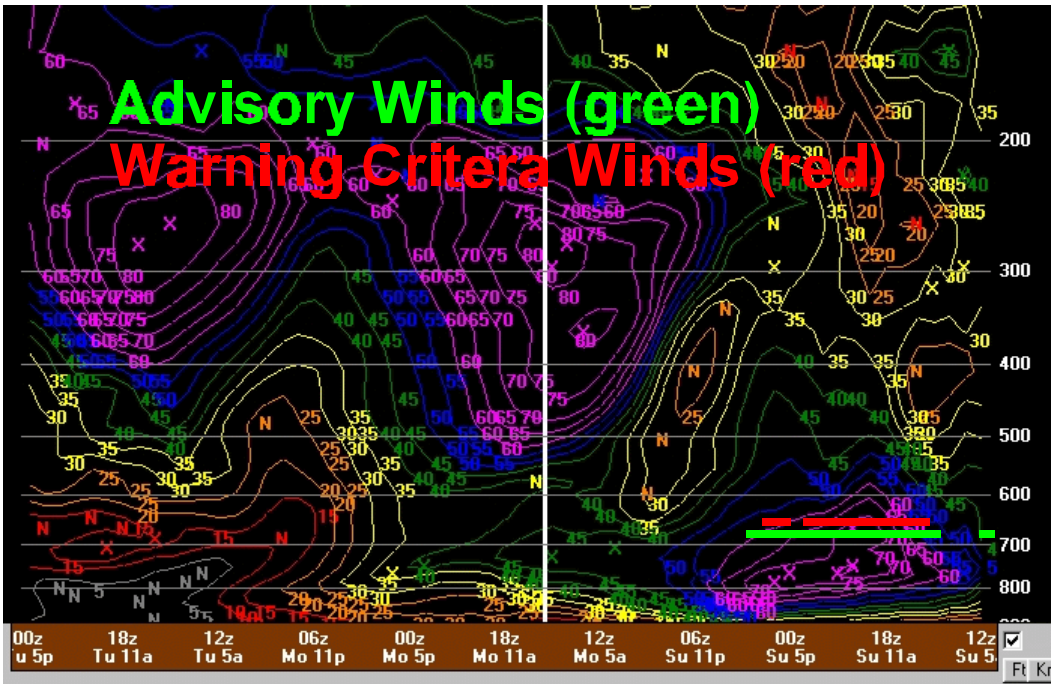

Figure 5. *BUFKIT Overview graphic (from the 12Z Rapid City run) illustrating the forecast of wind speed (knots). Green and red horizontal color bars represent the period of time that advisory-criteria and warning-criteria winds occurred at the Rapid City Airport.*